Spatial Orientation: Design and Training Issues

LCDR Fred Patterson, MSC USN
Naval Aerospace Medical Research Laboratory, 51 Hovey Road,Pensacola, Florida 32508-1046
(850) 452-4656
patterso@namrl.navy.mil

Since January 1996, several Navy aircraft accidents Since January 1996, several Navy aircraft accidents have been linked to spatial disorientation compounded by poor cockpit designs. These design problems reportedly confound aviators' sensory-spatial reflexes during "eyes-out" to "eyes-in" instrument transitions. To prevent similar mishaps from occurring, the proposed research is aimed at improving cockpit design standards by defining relationships between sensory-spatial incompatibility, pilot spatial awareness, and pilot performance.

Conventional wisdom describing aviation spatial awareness is based on the assumption that pilots view a moving horizon through the windscreen. This assumption presupposes head alignment with the vertical cockpit axis during both visual (VMC) and instrument (IMC) maneuvers. Even though this visual-spatial assumption has been widely incorporated into many cockpit designs, its accuracy has not been verified. In fact, recent studies contradict this assumption by identifying a sensory-spatial reflex that causes coronal head tilt in the direction of the horizon during real and simulated VMC flight. This head-movement reflex, called the opto-kinetic cervical reflex (OKCR), is thought to improve pilot spatial awareness by stabilizing the retinal image of the horizon. Because disorientation is frequently associated with "out-to-in" visual transitions, it is important to determine the role of OKCR during this critical phase of flight.

The goals of the project are twofold: The first is to determine how sensory spatial reflexes, such as OKCR, impact pilot spatial strategies. The second is to enhance pilot performance through training that includes revised and more accurate sensory spatial awareness models. Ongoing experiments are examining the effects of field-of-view restrictions attributable to head mounted displays on spatial reflexes and cockpit performance.